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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/941,247	08/28/2001	Roland A. Wood	H0002238	5916

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EXAMINER

CREPEAU, JONATHAN

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 07/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/941,247

Applicant(s)

WOOD, ROLAND A.

Examiner

Jonathan S. Crepeau

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 May 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 36 is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-35 and 37 is/are rejected.
- 7) ☒ Claim(s) 5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 4-12-04
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. This Office action addresses claims 1-35 and newly added claims 36 and 37. Claim 36 is allowed, and claim 5 is objected to as containing allowable subject matter. Although claims 1-4 and 6-35 have been amended, these claims remain rejected for substantially the reasons of record, and claim 37 is also rejected for these reasons. Accordingly, this action is made final.

Claim Rejections - 35 USC § 102

2. Claims 1, 2, 4, 6, 9, 10, 17, 18, 21, 22, 24, 26, 30, 31, 33, and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Bailey, Jr. et al (U.S. Patent 4,261,955). Regarding claims 1, 2, 22, and 24, the reference teaches an electrical power generator comprising a single-chamber water vapor generator (28) and a hydrogen gas generator (12) attached to the water vapor generator via conduits (22) (see Fig. 2). A fuel cell is attached to the hydrogen gas generator via a conduit (26) (see Fig. 2, col. 2, line 5). Regarding claims 1 and 22, the hydrogen gas generator contains a substantially non-fluid metal hydride material (see col. 1, line 55). Regarding claims 4 and 26, the water vapor generator comprises a chamber which is filled with liquid water (28) and has water vapor above it (see Fig. 2). Regarding claim 6, the metal hydride reacts with water vapor to produce hydrogen (see col. 2, line 9). Regarding claim 9, hydrogen is "initially loaded" into the outlet conduits (26) as needed (see col. 2, line 11). Regarding claims 10 and 34, a manifold (34) is present so as to direct more water into the water vapor generator and provide an

“initial flow” of water vapor (see Fig. 1; col. 2, line 7). Regarding claim 17, porous membranes (i.e., plugs) (20) impede the flow of liquid from the water vapor generator but allow passage of hydrogen gas and water vapor therethrough (see Fig. 2). Regarding claims 18 and 30, the hydride fuel is present in “pellet” or “granule” form (see Fig. 2). Regarding claims 21, 31, and 33, the water vapor generator comprises a tensile membrane (24) which pumps water vapor (see Fig. 2).

Thus, the instant claims are anticipated.

3. Claims 1, 4, 6, 9, 10, 11, 18, 21, 22, 26, 28, 30, 31, 33, and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Taschek (U.S. Patent 4,155,712). Regarding claims 1 and 22, the reference teaches an electrical power generator comprising a single-chamber water vapor generator (3) and a hydrogen gas generator (2) attached to the water vapor generator (see Fig. 1). A fuel cell is attached to the hydrogen gas generator via a conduit (9) (see Fig. 1; col. 4, line 40). Regarding claims 1, 11, 22, and 28, the hydrogen gas generator contains a substantially non-fluid metal hydride material such as calcium hydride or lithium aluminum hydride (see col. 3, line 65 et seq.). Regarding claims 4 and 26, the water vapor generator comprises a chamber which is filled with liquid water (7) and has water vapor above it (see Fig. 1). Regarding claim 6, the metal hydride reacts with water vapor to produce hydrogen (see col. 4, line 4). Regarding claim 9, hydrogen is “initially loaded” in the hydrogen gas generator as needed (see col. 4, line 45 et seq.). Regarding claims 10 and 34, a water tank (7) is present so as to direct more water into the

water vapor generator and provide an "initial flow" of water vapor (see Fig. 1). Regarding claims 18 and 30, the hydride fuel is present in "pellet" or "granule" form (see Fig. 1). Regarding claims 21, 31, and 33, the water vapor generator comprises a tensile membrane (4) which pumps water vapor (see Fig. 1).

Thus, the instant claims are anticipated.

Claim Rejections - 35 USC § 103

4. Claims 12, 13, and 29 rejected under 35 U.S.C. 103(a) as being unpatentable over Taschek in view of Hoffman et al (U.S. Patent 4,055,632).

Taschek is applied to claims 1, 4, 6, 9, 10, 11, 18, 21, 22, 26, 28, 30, 31, 33, and 34 for the reasons stated above. In addition, the reference states that the fuel can be "any suitable metal hydride" in column 3, line 65. However, the reference does not expressly teach that the metal hydride is sodium borohydride, as recited in claims 12 and 29, or that the hydrogen generator further comprises a hydrogen generation catalyst, as recited in claim 13.

Hoffman et al. is directed to a hydrogen gas generator. In column 2, line 67 et seq., the reference teaches that the generator comprises a metallic hydride such as sodium borohydride and a catalyst such as cobalt chloride.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Hoffman et al. to use sodium borohydride and cobalt chloride in the hydrogen

generator of Taschek. In the cited passage, Hoffman et al. state that these materials are “preferred.” Thus, the artisan would have sufficient motivation to use these materials in the hydrogen generator of Taschek. Accordingly, the subject matter of claims 12, 13, and 29 would be rendered obvious to the skilled artisan.

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taschek in view of Hoffman et al. as applied to claims 12, 13, and 29 above, and further in view of Suda (U.S. Patent 6,358,488).

Neither Taschek nor Hoffman et al. expressly teach that the catalyst is cobalt, nickel, or ruthenium, as recited in claim 14.

Suda is directed to a method of generation of hydrogen gas involving metal hydrides and water. In column 4, line 24, the reference teaches that cobalt and nickel can be used as catalysts in the reaction.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Suda to use cobalt or nickel as the catalyst of the modified system of Taschek. In column 4, line 17, Suda teaches that “it is essential in the inventive method that the reaction is promoted catalytically by a catalyst material brought into contact with the reaction medium.” Accordingly, the artisan would be motivated to use cobalt or nickel as the catalyst of Taschek, thereby rendering the subject matter of claim 14 obvious.

6. Claims 7 and 8 rejected under 35 U.S.C. 103(a) as being unpatentable over Bailey, Jr. et al. in view of Kojima et al (U.S. Pre-Grant Publication No. 2001/0022960).

Bailey, Jr. et al. is applied to claims 1, 2, 4, 6, 9, 10, 17, 18, 21, 22, 24, 26, 30, 31, 33, and 34 for the reasons stated above. However, the reference does not expressly teach that an inert gas, particularly nitrogen or argon, is present in the water vapor generator, hydrogen generator, and fuel cell, as recited in claims 7 and 8.

Kojima et al. is directed to a hydrogen generating method involving a metal hydride, water, and a catalyst. In paragraph 69, the reference teaches that the reaction system comprises gases such as nitrogen or argon which are inert to the reaction.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the nitrogen or argon of Kojima et al. in the components of the system of Bailey, Jr. et al. As would be appreciated by the artisan, hydrogen is a highly reactive and explosive gas that must be handled in an appropriate manner. Accordingly, the artisan would be motivated to incorporate nitrogen or argon throughout the system components of Bailey, Jr. et al. in hopes of increasing the safety of the system.

7. Claims 19, 20, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bailey, Jr. et al. in view of Lehmeier et al (U.S. Patent 5,942,344).

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Bailey, Jr. et al. is applied to claims 1, 2, 4, 6, 9, 10, 17, 18, 21, 22, 24, 26, 30, 31, 33, and 34 for the reasons stated above. However, the reference does not expressly teach that the fuel cell is heated with a heater, as recited in claims 20 and 32, or that the fuel cell is at least partially surrounded by insulation, as recited in claim 19.

Lehmeier et al. is directed to a high-temperature fuel cell surrounded by a heating element (12, 14) and insulation (9) (see the Figure; col. 3, line 49).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the fuel cell of Lehmeier et al. and its associated heater and insulation in the system of Bailey, Jr. et al.

In column 2, line 14, Lehmeier et al. teaches the following:

It is accordingly an object of the invention to provide a high-temperature fuel cell system and a method for its operation, which overcome the hereinafore-mentioned disadvantages of the heretofore-known devices and methods of this general type and in which the high-temperature fuel cells are not polluted or damaged during heating.

Accordingly, the artisan would be motivated to use the fuel cell and associated components of Lehmeier et al. in the system of Bailey, Jr. et al. in hopes not polluting or damaging the fuel cell during heating.

8. Claims 3, 23, 25, 35, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bailey, Jr. et al. in view of Condit et al (U.S. Patent 6,432,566).

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Bailey, Jr. et al. is applied to claims 1, 2, 4, 6, 9, 10, 17, 18, 21, 22, 24, 26, 30, 31, 33, and 34 for the reasons stated above. However, the reference does not expressly teach that the system comprises a return line for returning water and hydrogen gas from the fuel cell to the water vapor generator, as recited in claims 3, 23, 25, 35, and 37.

Condit et al. is directed to a fuel cell power plant. In column 3, line 7, Condit et al. teach that recycling product water from a fuel cell is known.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of Condit et al. would motivate the artisan to incorporate a water/hydrogen return line into the system of Bailey, Jr. et al. In column 3, line 4, Condit et al. teach the following:

significantly in humidity. Consequently, it is known to undertake substantial efforts to humidify the process oxidant and reducing fluid streams in order to minimize water loss from the PEM electrolyte. Known efforts include recycling some of the product water from the cell, and/or directing some of the cooling fluid within the coolant system as a vapor into the process oxidant and/or reducing fluid streams entering the fuel cell. However, with known fuel cells, the

Accordingly, the artisan would be motivated to incorporate a water return line in the system of Bailey, Jr. et al. in hopes of keeping a PEM electrolyte humidified. Furthermore, the artisan would also be motivated to recycle hydrogen so as to increase the efficiency of the system. Thus, the claimed subject matter would be rendered obvious to the skilled artisan.

9. Claims 15, 16, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bailey, Jr. et al. in view of Kobayashi et al (U.S. Pre-Grant Publication No. 2001/0053469).

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Bailey, Jr. et al. is applied to claims 1, 2, 4, 6, 9, 10, 17, 18, 21, 22, 24, 26, 30, 31, 33, and 34 for the reasons stated above. However, the reference does not expressly teach that the system comprises a pump or a valve between the water vapor generator and fuel cell for regulating the flow of hydrogen and water vapor thereto, as recited in claims 15, 16, and 27.

Kobayashi et al. is directed to an apparatus for warming up a fuel cell. In Figure 1 and paragraph 68, the reference teaches a hydrogen supplying apparatus comprising a pump (33) and a regulator (valve) (32).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the regulator and pump of Kobayashi in the system of Bailey, Jr. et al. In paragraph 70, Kobayashi teaches that the regulator prevents the external leakage of flowing hydrogen, thereby improving fuel cell efficiency. Additionally, the artisan would recognize more generally that flow-control elements such as valves and pumps advantageously allow for precise process control in fuel cell systems. Accordingly, the artisan would have sufficient motivation to use the valve and pump of Kobayashi in the system of Bailey, Jr. et al.

Response to Arguments

10. Applicant's arguments filed May 5, 2004 have been fully considered but they are not persuasive. Applicants generally assert that the systems of Taschek and Bailey Jr. et al. have a continuously replenishing water supply, whereas the system of the invention does not. However,

it is submitted that the claim language does not fully reflect this configuration and is still met by the references. The independent claims recite that the water vapor generator comprises a “single” chamber. It is believed that the water vapor generators of the references also comprise single chambers because the external water reservoirs and conduits are not considered to be part of the water vapor generators *per se*. As such, the water vapor generator of each reference (element 28 in Bailey and element 3 in Taschek) is considered to comprise a “single chamber,” as claimed. The new language also recites “wherein the size of the chamber determines the quantity of water available to the hydrogen gas generator.” It is submitted that the size of the chambers of the references would inherently function to determine the quantity of water available. Applicants state that “[n]either of these references show a system having a fixed water supply, with the available quantity of water determined solely by the size of the water vapor chamber itself.” However, the limitation that the water quantity is determined *solely* by the size of the chamber is not recited in the claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Accordingly, as the size of the chamber is one factor (among, perhaps, several possible factors) that determines the amount of water available, the amendatory language is still believed to be met by the references. As such, the rejections over Taschek and Bailey are maintained.

With regard to new claim 37, Applicants assert that the claim requires a return line “which is not shown in the prior art in a system where hydrogen gas is generated.” However, as noted above, it would have been obvious to include a return line as disclosed by Condit in the fuel cell system of Bailey. Regarding Condit, Applicants assert that this reference “has

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absolutely nothing to do with the generation of hydrogen from a powdered fuel by reaction of the fuel with water vapor.” However, it is submitted that Condit does not have to disclose such a hydrogen generation apparatus to qualify as analogous prior art. Condit is directed to a fuel cell system, as is Bailey. The motivation to include the return line of Condit in the system of Bailey has been set forth above, and thus, there is a reasonable expectation of success upon making the modification. As such, the rejection of claims 3, 23, 25, 35, and 37 over Bailey in view of Condit is still believed to be proper.

Allowable Subject Matter

11. Claim 36 is allowed.
12. Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
13. The following is a statement of reasons for the indication of allowable subject matter (these reasons are identical to those set forth in the previous Office action and are reiterated herein):

Claims 5 and 36 each recite, among other features, that the water vapor generator is at least partially filled with ice. Neither Bailey Jr. et al. nor Taschek, the closest prior art, teach or fairly suggest this feature. Accordingly, claim 36 is allowable and claim 5 contains allowable subject matter.

Conclusion

14. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr, can be reached at (571) 272-1414. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

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system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jonathan Crepeau

Patent Examiner

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July 23, 2004